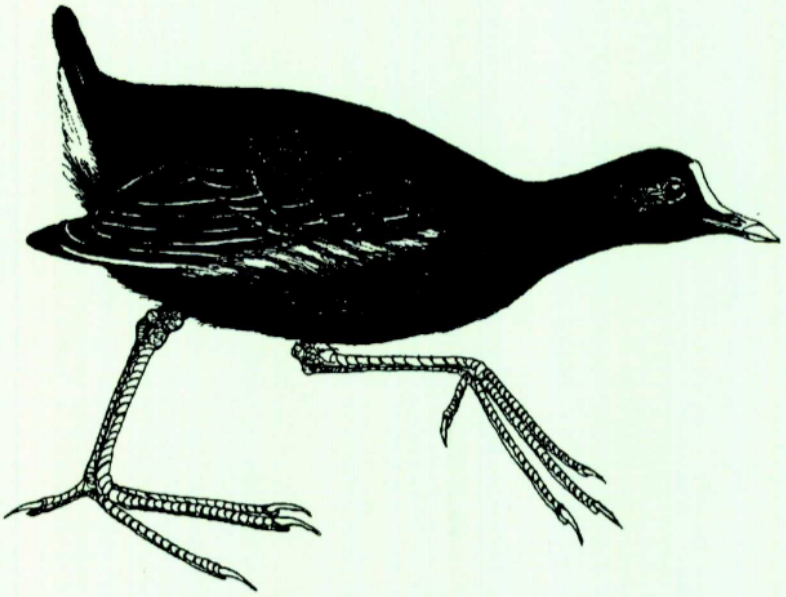
RECOVERY PLAN

MARIANA COMMON MOORHEN

Gallinula chloropus guami



U.S. DEPARTMENT OF THE INTERIOR
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RECOVERY PLAN FOR THE

MARIANA COMMON MOORHEN (= GALLINULE)

(*Gallinula chloropus guami*)

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THIS IS THE COMPLETED MARIANA COMMON MOORHEN RECOVERY PLAN. IT DELINEATES REASONABLE ACTIONS WHICH ARE BELIEVED TO BE REQUIRED TO RECOVER AND/OR PROTECT THE SPECIES. OBJECTIVES WILL BE ATTAINED AND ANY NECESSARY FUNDS MADE AVAILABLE SUBJECT TO BUDGETARY AND OTHER CONSTRAINTS AFFECTING THE PARTIES INVOLVED, AS WELL AS THE NEED TO ADDRESS OTHER PRIORITIES. THIS RECOVERY PLAN DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF THE COOPERATING AGENCIES, AND IT DOES NOT NECESSARILY REPRESENT THE VIEWS OF ALL INDIVIDUALS WHO PLAYED A ROLE IN PREPARING THIS PLAN. IT IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS, CHANGES IN SPECIES STATUS, AND COMPLETION OF TASKS DESCRIBED IN THE PLAN.

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY OF THE RECOVERY PLAN FOR THE MARIANA COMMON MOORHEN (= GALLINULE) (*Gallinula chloropus guami*)

Current Species Status: The Mariana common moorhen (*Gallinula chloropus guami*) is federally listed as an endangered species. Current population estimates are not known for all sites; however, there are estimated to be between 100 and 200 birds on Guam, between 20 and 125 birds on Tinian and between 60 and 120 birds on Saipan. Loss of wetland habitat is considered the prime threat to the survival of this species.

Habitat Requirements and Limiting Factors: The moorhen is an inhabitant of emergent vegetation of freshwater marshes, ponds and placid rivers. In the Mariana Islands its preferred habitat includes freshwater lakes, marshes and swamps. Both man-made and natural wetlands are used. The key characteristics of moorhen habitat appear to be a combination of deep (greater than 60 cm) marshes with robust emergent vegetation and equal areas of cover and open water. This species is known to be wary and to be closely associated with cover provided by edge vegetation. The most serious threat to the continued existence of the moorhen is the continuing disappearance of suitable wetland habitat, through extensive human use and the spread of undesirable vegetation.

Recovery Objective: Interim goal is to downlist to threatened status.

Recovery Criteria: Downlisting objectives are to protect and manage wetlands and to maximize productivity and survival of the Mariana common moorhen throughout its range. Efforts should be made to protect and manage a total of 240 ha (600 acres) of suitable wetland habitat on Guam, 120 ha (300 acres) on Saipan, and 30 ha (75 acres) on Tinian. Downlisting population densities should be equal to or greater than 2.5 birds/ha (1 bird/acre), or 600 adult birds for

Guam, 300 birds for Saipan and 75 birds for Tinian. These population numbers and densities must be maintained for 5 consecutive years.

Actions Needed:

1. Secure and manage primary habitats.
2. Maintain and manage secondary habitats and other areas to supplement the primary areas.
3. Maximize productivity and survival of adults and young.
4. Determine biological parameters needed for development of delisting criteria.

Total Estimated Cost of Recovery ($1,000):

Year	Need 1	Need 2	Need 3	Need 4	Total
1992	0	0	21	0	21
1993	22	0	96	0	118
1994	186	20	86	0	292
1995	186	20	31	50	287
1996	186	20	31	50	287
1997	186	20	87	40	333
1998	186	0	87	14	287
1999	186	0	87	0	273
2000	186	0	87	0	273
2001	186	0	87	0	273
2002	186	0	87	0	273
2003	186	0	87	0	273
2004	186	0	87	0	273
2005	186	0	87	0	273
Total	2254	80	1048	154	3536

Note: Values for securing wetlands and developing and implementing brown tree snake control are undetermined at this time.

Date of Recovery: 2005 - Interim Goal

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RECOVERY PLAN FOR THE MARIANA COMMON MOORHEN

I. INTRODUCTION

Brief Overview

The Mariana common moorhen (Gallinula chloropus guami) was listed as an endangered species on August 27, 1984 (49 FR 33881-33885). This species was listed with eight other endemic species of the Mariana Island chain (addressed by other recovery plans) which have experienced serious declines in their populations in recent years. Various factors have been implicated in the decline of these species, but habitat loss is considered the prime factor affecting the Mariana common moorhen. No critical habitat was established for this species. It was determined at the time of listing that critical habitat would result in no benefit to the species.

Taxonomy

The recent nomenclature changes by the American Ornithologists' Union (1984) include the change in name from the common gallinule to the common moorhen. Thus, this plan will refer to this endangered subspecies as the Mariana common moorhen. Although this species was originally listed as the Mariana gallinule, it is now listed in 50 CFR 17 (Code of Federal Regulations) as the Mariana common moorhen.

This species is distributed nearly world-wide. Various subspecies are described from North America, Eurasia, the North Pacific, and South America (American Ornithologists' Union 1984). The Mariana subspecies is endemic to the Mariana Archipelago.

The moorhen is a member of the rail family (Rallidae) and subfamily (Rallinae) within the order Gruiformes. In the past, this species had been known as Fulica chloropus or Gallinula galeata var. sandwichensis. The accepted scientific name of this subspecies is currently Gallinula chloropus guami (Hartert 1917). In the Mariana Islands it is locally known as Pulattat (the swamp bird).

Description

The moorhen is a slate-black bird about 35 cm (14 inches) in length. Its distinguishing physical characteristics include a red bill and frontal shield, white undertail coverts, a white line along the flank, and long olive-green legs with large feet (Baker 1951). The female resembles the male but usually has a smaller frontal shield. The immature resembles the adult but the plumage is paler and browner, the frontal shield is small, and the bill and frontal shield are pale yellow or brown.

Historical Range and Population Status

The Mariana common moorhen was historically confined to wetland areas of Guam, Saipan, Tinian, and Pagan of the Mariana Islands (Figure 1). Only these islands have the permanent freshwater wetlands capable of supporting the moorhen in the Mariana Archipelago.

Although data are scant, historical populations on Guam were considered numerous and widely distributed. The major wetland areas apparently supported substantial populations. Seale (1901) found this bird to be abundant in the marshes and taro patches on Guam. In 1945, the Naval Medical Research No. 2 Expedition found fairly large populations in freshwater marshes and fallow rice paddies. The greatest concentrations appeared to be in Agana Swamp and along the Ylig River (Baker 1951).

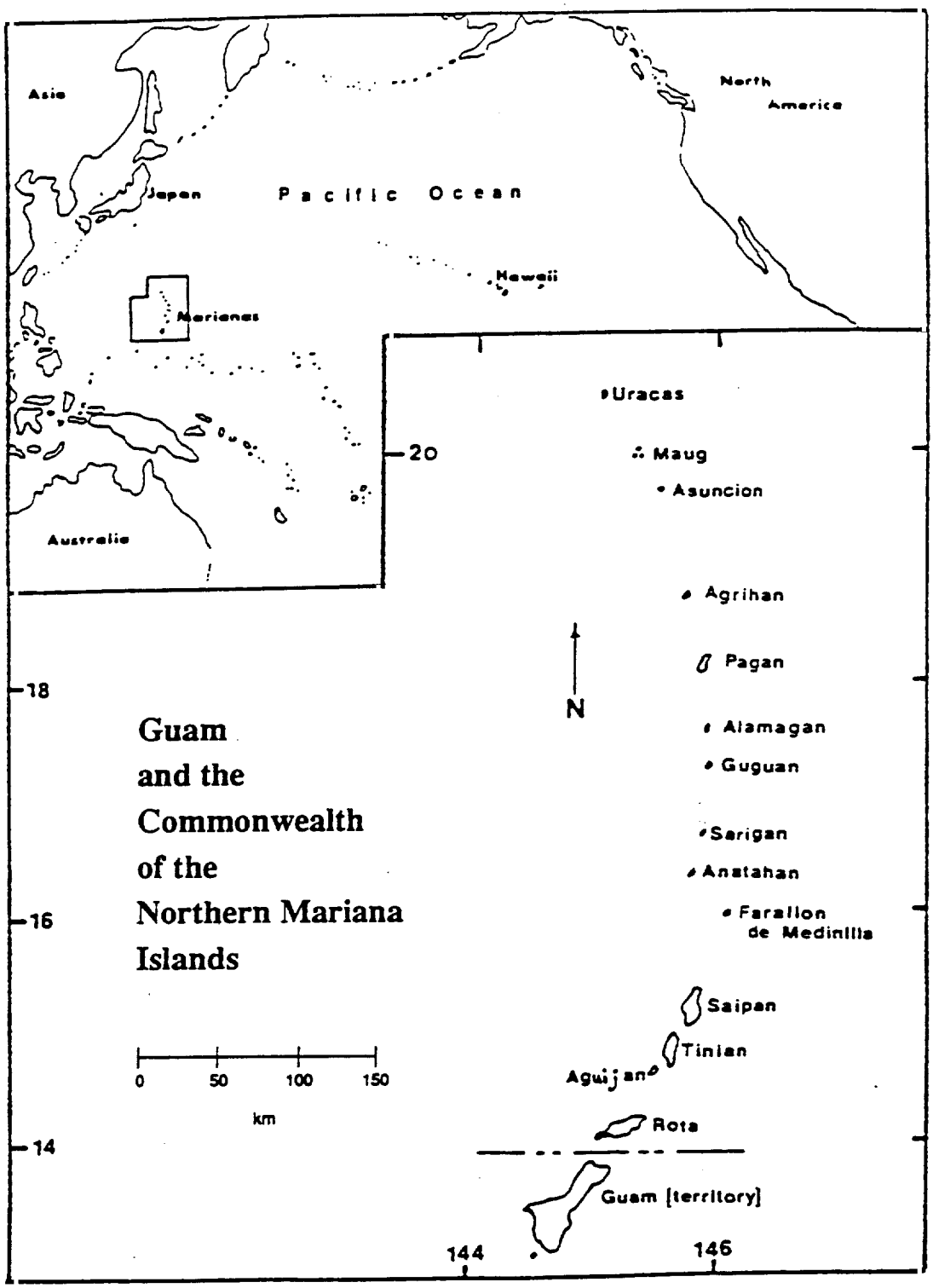

Figure 1. Map of the Mariana Islands.

During the early part of this century, the moorhen was considered rare in the Northern Mariana Islands by some observers. Permanent wetland habitats on these islands have always been scarce; thus, island-wide populations have been small. Nonetheless, populations of moorhen were regarded as abundant in good habitat such as Lake Hagoi on Tinian and Lake Susupe on Saipan (Stott 1947, Marshall 1949).

Current Range and Population Status

Recent surveys indicate the moorhen remains in moderate numbers in the limited wetland habitats remaining in the Mariana Islands (Engbring et al. 1986). Moorhens are known to inhabit at least 6 primary and 24 secondary wetlands in the Marianas (Table 1, Figures 2 through 4) [Tenorio 1979, Guam Division of Aquatic and Wildlife Resources (DAWR), unpubl. data; Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife (CNMIDFW), unpubl. data]. Other small wetlands undoubtedly exist that have yet to be described. "Primary" habitats are defined as those sites providing the highest present or potential value as moorhen habitat, based on such factors as size, number of moorhens previously observed, consistency of water levels, quality of vegetation for moorhens, and location. "Secondary" habitats, based on the same criteria, are low in value compared to primary habitats and may accommodate other uses. Much of the information on habitat quality is preliminary and should be further researched and refined.

There are three primary wetlands on Guam: Agana Marsh, Fena Valley Reservoir, and Naval Station Marsh. Agana Marsh is a 70 ha, natural freshwater marsh near the coast of west-central Guam. Ownership of this site is mixed; the majority is in private hands. About 16 ha is owned by the Government of Guam. Although this marsh was probably excellent habitat in the past, it has been changed significantly by human activities and by the increase of

Table 1. Known wetlands currently or potentially supporting Mariana common moorhens.

Island and site	Approx. size (ha)	Habitat quality	Ownership	Primary use	Threats
GUAM:					
<u>Primary</u>					
Agana Marsh	71	Low, good potential	Private, Gov. Guam	Small part cultivated	1,2,3
Fena Valley Reservoir	81	Moderate, some potential	U.S. Navy	Water reservoir	
Naval Station Marsh	40	High, good potential	U.S. Navy	Unused	1,2,3
<u>Secondary</u>					
Naval Magazine Marshes (five sites)	6	Moderate, some potential	U.S. Navy	Unused	1
Naval Magazine Pond	<1	High	U.S. Navy	Water source	
Piti Wetlands (inland from road)	8	Low, some potential	U.S. Navy	Unused	1

Table 1 - concluded.

Island and site	Approx. size (ha)	Habitat quality	Ownership	Primary use	Threats
Puntan Muchot/Garapan Wetlands	5	Low, good potential	Local government, private	Unused	1,2,3
Secondary					
Chalan Laulau Wetlands	4	Low, some potential	Private	Unused	1,2,3
Sadog Tase Wetlands	18	Moderate	Local government	Unused	1,2,3
Tanapag Wetlands	2	High	Local government, private	Unused	1,2,3
Kagman Wetlands	3	High	Local government, private	Reservoir unused	
San Roque	5	Moderate, good potential	Private	Unused	1,2,3
Flores Pond	4	High	Private	Unused	2,3

Table 1 - continued

Island and site	Approx. size (ha)	Habitat quality	Ownership	Primary use	Threats
San Luis Point Pond	4	Low, some potential	U.S. Navy	Unused	
Sumay Pond (both sides of road)	1	Low, some potential	U.S. Navy	Unused	1,3
Barrigada Ponding Basin	<1	High	Gov. Guam	Ponding basin	1,2
DOA Wetland	<1	Moderate, good potential	Gov. Guam	Unused pasture	1,2,3
Mangilao Prison Pond	<1	Low, low potential	Gov. Guam	Water source	2
Mariana Terrace Ponding Basin	<1	Low, good potential	Gov. Guam	Ponding basin	1,2
Masso Reservoir	2	Low, some potential	Gov. Guam	Water source	1,2
Toguan Bay Sewage Treatment Pond	<1	Low, some potential	Gov. Guam	Sewage treatment pond	2
Agfayan River Floodplain	8	Low, some potential	Private	Some aquaculture development	1,2,3

Table 1 - continued

Island and site	Approx. size (ha)	Habitat quality	Ownership	Primary use	Threats
Ajayan River Floodplain	8	Low, some potential	Private	Some aquaculture development	1,2,3
Guam Shell Inc. (four sites)	2	High, good potential	Private	Water source for fire control	1,2,3
Inarajan River Floodplain	16	Low, some potential	Private	Unused	
Pulantat Marsh (two sites)	2	Moderate, some potential	Private	Unused	2,3
Atantano Wetland (east of road, freshwater only)	40	Low, some potential	Private, U.S. Navy	Some parts cultivated	1,2,3
Namo River Marsh (inland from road)	16	Low, some potential	U.S. Navy, Private	Unused	1,2,3
Talofofo Floodplain	8	Low, some potential	Private, Gov. Guam	Some aquaculture development	1,2,3
Assupian	<1	High (seasonal)	Private	Some parts culivated	2,3

Table 1 - continued

Island and site	Approx. size (ha)	Habitat quality	Ownership	Primary use	Threats
Yabai	1-2	High (seasonal)	Private	Some parts cultivated	1,2,3
TINIAN:					
Primary					
Lake Hagoi	18	High	Leased by Navy	Unused	1
Secondary					
Magpo Wetland	11	Low, some potential	Local government	Pump site for wells	1
SAIPAN:					
Primary					
Lake Susupe	162	Portions are high, others low	Local government, private	Unused	1,2,3

Key to Threats Specified in Table 1:

1 - Encroachment of undesirable vegetation.

2 - Direct human disturbance.

3 - Land development

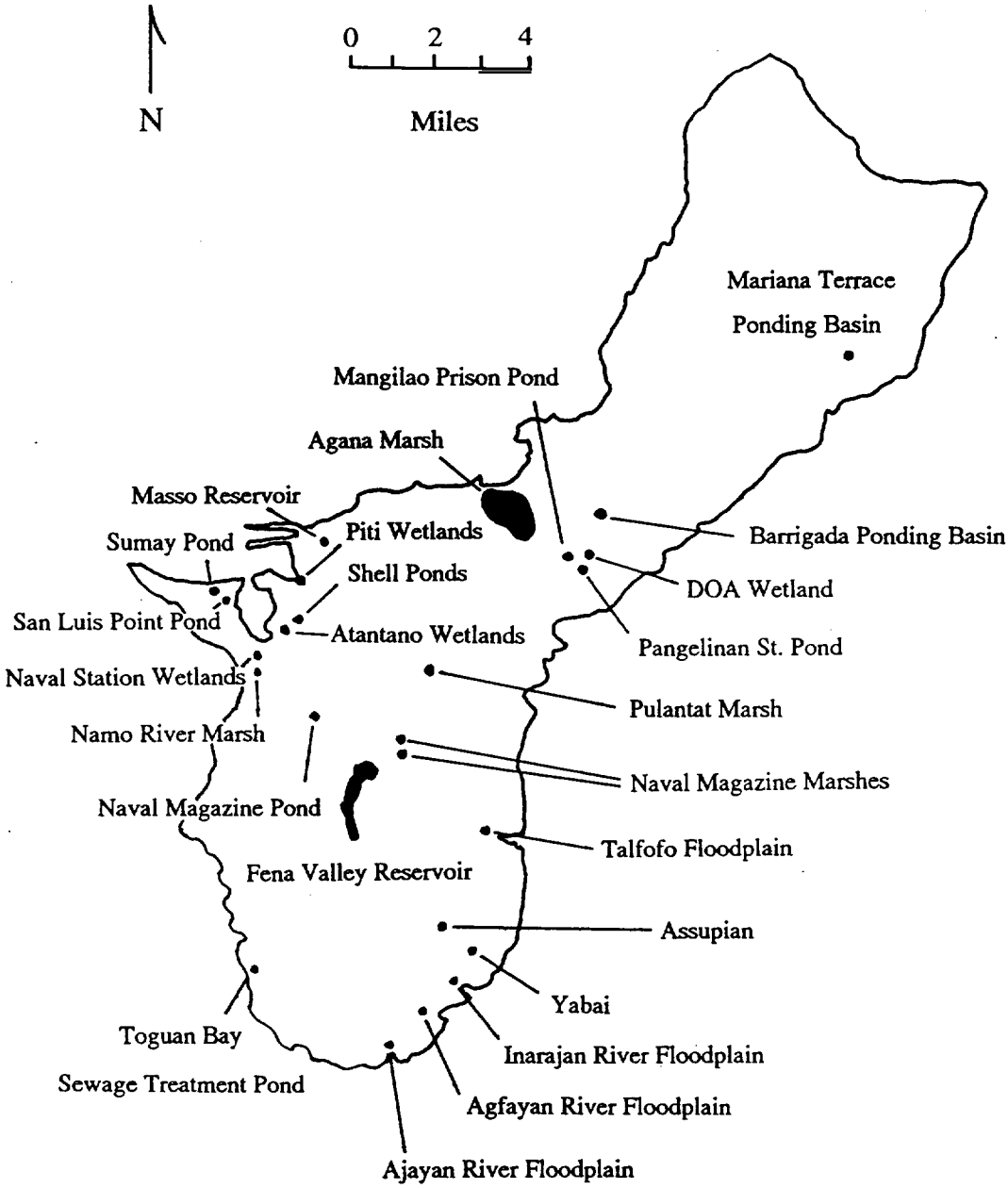

Figure 2

Known Wetlands Currently or Potentially Supporting Mariana Common Moorhens on Guam

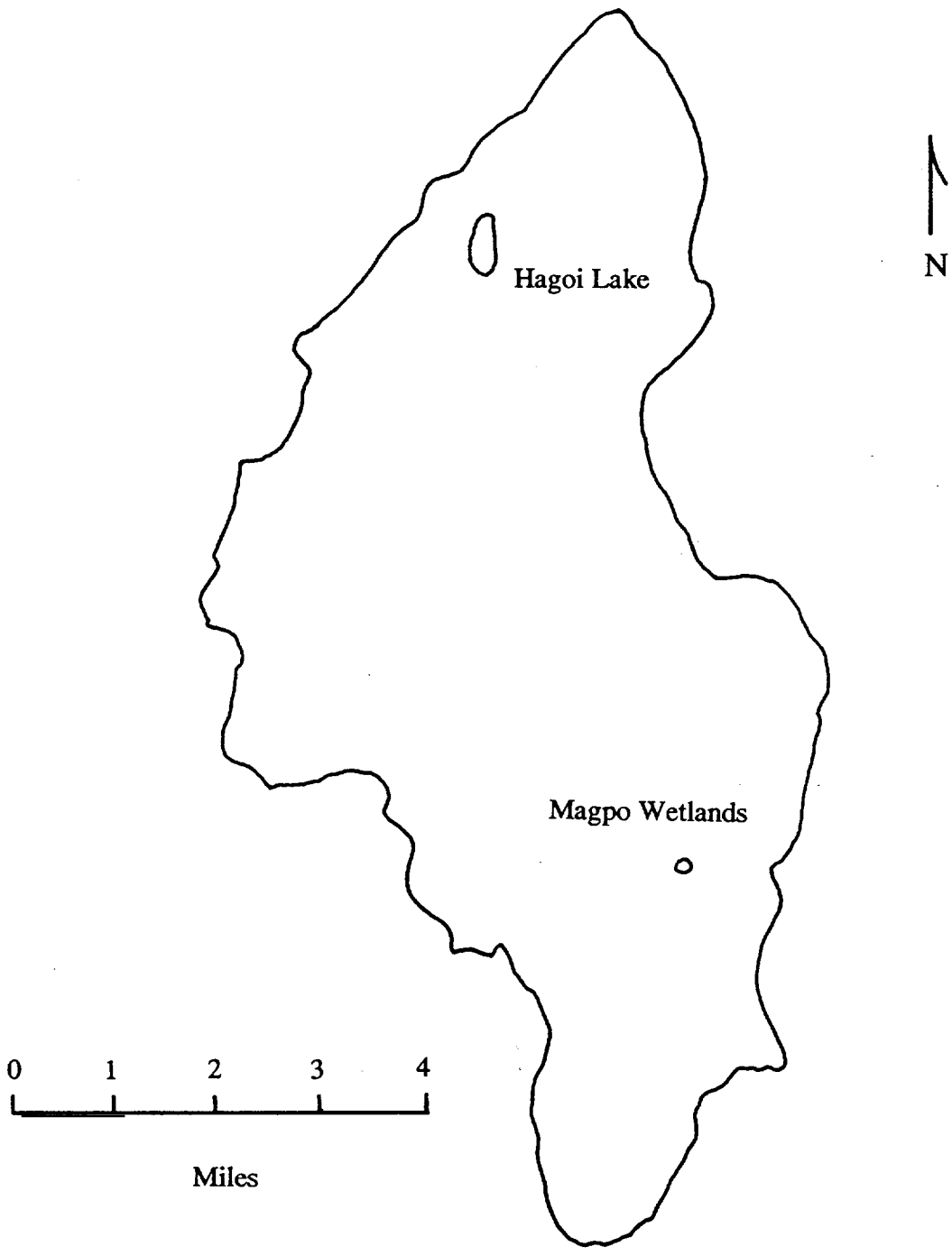

Figure 3

Wetlands Supporting Mariana Common Moorhen on Tinian.

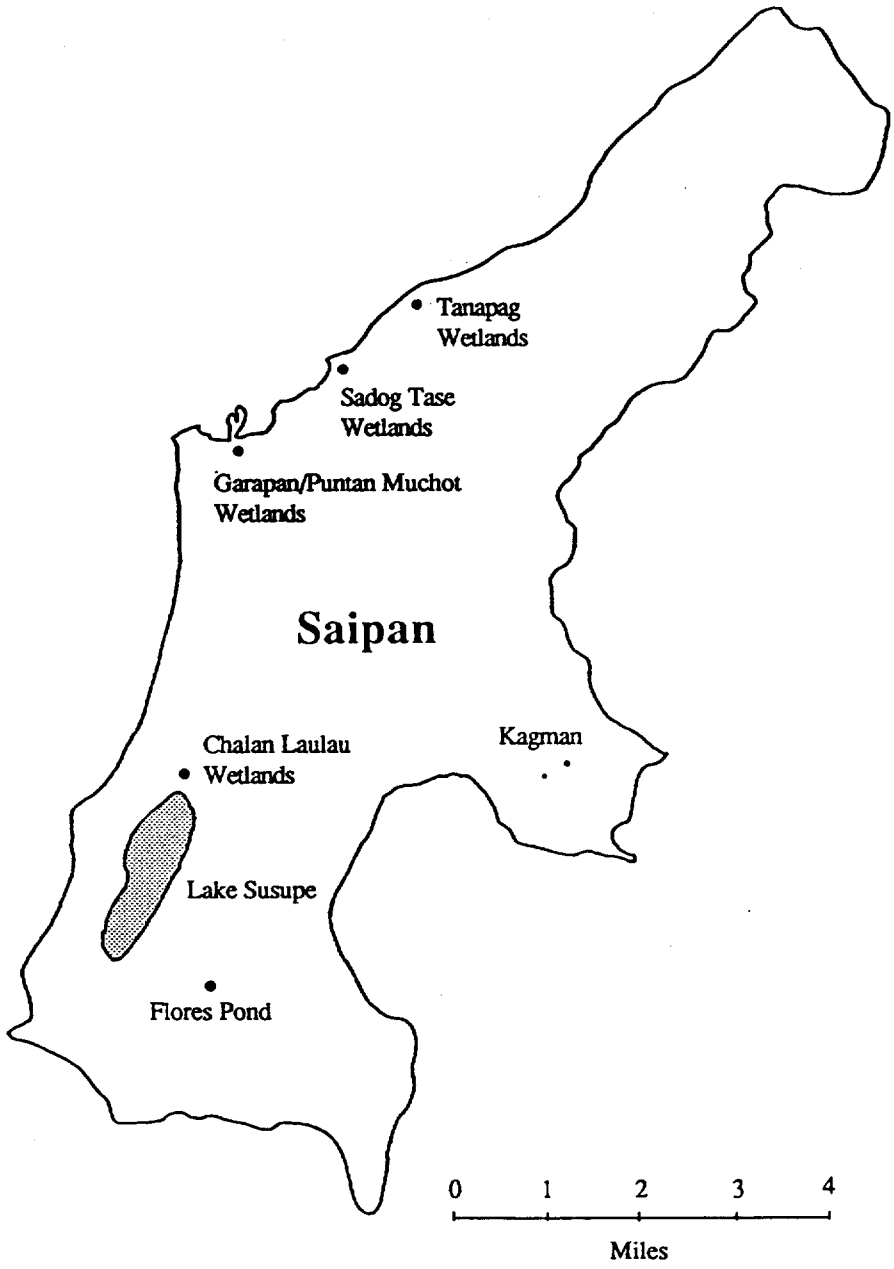

Figure 4

Wetlands Supporting Mariana Common Moorhen on Saipan

dense stands of vegetation such as Phragmites karka. Little open water remains. Taro is currently being cultivated on 1 ha of the marsh, and this area is used by moorhens.

Fena Valley Reservoir is a large man-made lake in south-central Guam. The fringes of portions of this reservoir have gentle slopes, support stands of emergent vegetation, and provide good habitat for the moorhen. The steep banks and deep water over most of this reservoir limit the habitat potential for moorhen.

Naval Station Marsh is a complex of marsh and ponds near the entrance to Apra Harbor on a Naval Reservation in west-central Guam. These wetlands total over 40 ha and are probably remnants of a once larger contiguous wetland site. While some portions are seriously degraded, others provide good habitat and still support moorhen. If managed properly this wetland could support a significant population of moorhen.

The 20 wetlands identified as secondary habitat on Guam can be divided into wetlands owned by the U.S. Navy, those owned by the Government of Guam, those owned privately, and those owned jointly by various parties (Table 1).

Population estimates are difficult to make for the moorhen. The total population on Guam has recently been estimated to be between 100 and 200 birds (48 FR 53730). No single wetland on Guam supports a large percentage of the total population on the island. The three primary habitats, Agana Marsh, Fena Valley Reservoir, and Naval Station Marsh, are believed to harbor a dozen or more birds each. All the other known wetlands probably support fewer than a dozen birds each.

Lake Hagoi on Tinian and Lake Susupe on Saipan are the most important wetlands on these two islands and harbor a large percentage of the total population there (Engbring et al. 1986).

Estimates range from 20-125 birds for Lake Hagoi and 60-120 for Lake Susupe (Engbring et al. 1986). Additional small populations on these two islands are scattered at the other wetlands identified in Table 1. At times, various stock ponds on Tinian, and Kagman and Flores ponds on Saipan may also support moorhens. Populations on Tinian and Saipan appear to be stable but their status is directly related to the future condition of wetland habitats (Figures 3 and 4).

Tinian has never had much wetland habitat, and Lake Hagoi, considered primary habitat, is the only large wetland on the island. It is an 18-ha marsh on the north end of the island. Only a small portion of the marsh, usually less than 1 ha, is open water. At one time Lake Hagoi was possibly much larger. It is excellent habitat and despite its small size supports one of the largest moorhen populations in the Marianas. Lake Hagoi, along with much of the northern half of Tinian, is leased by the U.S. Navy. The only site identified as secondary wetland habitat on Tinian is Magpo Wetland.

Saipan has two primary wetlands, Lake Susupe and Puntan Muchot/Garapan. Lake Susupe is one of the most important wetlands in the Mariana Islands. It is located in southwest Saipan and is made up of about 160 ha of dense Phragmites stands, freshwater marsh, and open water. It is primarily a natural wetland with a rich variety of emergent and floating vegetation, algae, mollusks, and aquatic insects. Lake Susupe is important to the moorhen as well as other waterfowl and was the last known habitat for the presumed extinct Mariana mallard (Anas oustaleti). Ownership is divided between local government and private interests.

The wetlands at the Puntan Muchot/Garapan site on Saipan have been affected by intensive human activity. Nonetheless, these two small areas, totaling about 4.5 ha, have good wetland habitat with potential for significant improvement. Moorhen consistently have

been seen in this area but the population size is not known. Ownership of the smaller Garapan site is private while the adjacent Puntan Muchot is divided between private and public ownership. There are at least three secondary wetlands on Saipan (Table 1).

The small population of moorhen once found on Pagan is believed to be extirpated due to the large quantities of ash and cinder deposited from the volcano eruption of May 1981 (T. Pratt pers. comm. 1987). Destruction of vegetation by feral ungulates may also have contributed to loss of this population (T. Pratt pers. comm. 1987).

Habitat Requirements

The moorhen is an inhabitant of emergent vegetation of freshwater marshes, ponds, and placid rivers, although it can occasionally be seen far from wetland areas. In the Mariana Islands the moorhen's preferred habitat includes freshwater lakes, marshes, and swamps. Man-made as well as natural wetlands are used, and moorhen have been observed at commercial fish ponds, taro patches, rice paddies, sewage treatment plants, and reservoirs (Guam DAWR unpubl. data).

The moorhen appears to be opportunistic, making use of small, temporary wetlands and newly created habitat. Although the moorhen favors freshwater areas, it occasionally uses brackish water sites such as tidal channels or mangrove wetlands for limited periods of time (Guam DAWR unpubl. report). The species is wary and shy, but it nonetheless makes use of wetlands near human activity.

The key characteristics of moorhen habitat in North America appear to be a combination of deep (greater than 60 cm) marshes with robust emergent vegetation and equal areas of cover and open water (Brackney 1979). Edge habitat appears to be an important factor.

Shallenberger (1978) stated that Mariana moorhens prefer open water bordered by vegetation. Guam DAWR biologists (unpubl. data) have observed moorhens to be wary and closely associated with cover provided by edge vegetation. Escape cover provides a physical and visual barrier from humans and potential predators, and is a key component of habitat that allows use of an area by moorhen. Escape cover is especially important where human activity is high.

Life History

Relatively little field research has been conducted on the Mariana subspecies of the common moorhen. Information from surveys, casual observations, and recently initiated field work provides the bulk of the knowledge on this subspecies. Considerable field work has been done on this species elsewhere in its range, particularly in North America.

Reproduction

Little is known of the reproductive characteristics of the Mariana common moorhen. Nests have been found in all months except October, and the moorhen is believed to breed throughout the year (in Guam DAWR unpubl. report; CNMIDFW 1986 unpubl. report).

In North America the moorhen generally builds floating nests in standing water normally less than 60 cm deep. Most nests are inconspicuously placed within dense emergent cover, but others are placed on protruding stumps, logs, or rocks. The moorhen will also use artificial platforms (e.g., floating boards) as a substrate on which to build nests (Guam DAWR unpubl. data). The Hawaiian subspecies builds nests by folding over the emergent vegetation into a platform nest (Shallenberger 1977). Apparently the particular species of plant is not important but stem density and height are. Nesting is apparently keyed to water depth and vegetation growth conditions (U.S. Fish and Wildlife Service 1985).

Clutch size of 4-8 for the Mariana common moorhen has been recorded; clutches as large as 13 have been recorded for other subspecies. Incubation period is about 22 days for the Hawaiian subspecies (Byrd and Zeillemaker 1983). Chicks are precocial and swim away from the nest shortly after hatching but remain close to and dependent on the parents for several weeks. Two clutches within one breeding season have been noted; observations indicate juveniles from earlier broods stay with adults and newly-hatched chicks in family groups (Guam DAWR unpubl. data).

Food habits

Moorhens feed on both plant and animal matter in or near water. Observers have noted grass, adult insects, and insect larvae in moorhen stomachs. Hawaiian moorhen have been recorded feeding on algae, aquatic insects, mollusks, seeds and other plant matter (Schwartz and Schwartz 1949, T. Telfer unpubl. data). Moorhen are probably opportunistic feeders, so the diet varies with the particular habitat (Shallenberger 1977).

Activity patterns

The Mariana common moorhen is a non-migratory form. Little is known of movement patterns of this subspecies within its range, and information is not available on the home range or territory size. Mariana common moorhen appear to be active both during the day and at night. Some evidence suggests that moorhens fly primarily at night (Guam DAWR unpubl. report).

Demographic units

The moorhen populations on Guam are considered to constitute one demographic unit (i.e., there is periodic gene flow between birds from all habitats), and those from the Northern Mariana Islands are considered to be a separate unit. Although birds may rarely fly between Guam and the Northern Mariana Islands, such movement is considered too rare to group these populations into a single demographic unit.

Reasons for Declines and Current Threats

Loss of wetland habitat is the most significant factor in the decline of this subspecies. Although quantitative data are lacking, there has been a significant reduction in suitable wetland habitat. Most areas are small and are significantly degraded by altered water regimes, introduced vegetation, and other human impacts. Many wetland sites in the Mariana Islands have been filled or dredged for commercial or residential development. Additionally, there has been a decline of traditional wetland agricultural practices such as taro and rice cultivation. Abandonment of these cultivated areas has diminished the amount of wetlands available to the moorhen.

Certain wetlands have experienced accelerated sediment build-up due to land clearing, road building, grassland fires, and other human activities (in Guam DAWR unpubl. report). Aggressive, emergent vegetation contributes to rapid filling and choking of many wetlands, especially those that have been partially drained or are being filled by sediment. Many excellent wetlands (e.g., Agana Marsh) have been significantly altered and are now only marginal moorhen habitat because of encroachment by plant species such as Phragmites karka.

Introduced predators may also present a problem. The brown tree snake (Boiga irregularis) has been implicated as the major cause of the decline of most of Guam's bird species. Although it has been found in wetland areas, it is not considered a regular inhabitant of such habitat. The overall effect of this snake is not known. Predation by feral cats or feral dogs could be a problem in some areas.

The moorhen was historically used as a food item by the local Chamorro people. Overhunting may have been a problem in the past and poaching apparently continues to some extent today, but the effect on the population is not known.

Conservation Efforts

As a Federally listed endangered species, the Mariana common moorhen is afforded the protections and provisions under the Endangered Species Act of 1973, as amended, and the Migratory Bird Treaty Act. It is also protected by the Territory of Guam Endangered Species Act and Commonwealth of the Northern Marianas wildlife regulations. Section 404 of the Clean Water Act of 1977 provides regulations that protect wetland habitat from being filled without authorization from the U.S. Army Corps of Engineers. This law provides some protection for moorhen habitat.

Presidential Executive Order 11990 also extends direction to Federal agencies to maintain and protect wetland resources of the United States. Wetlands are protected under Guam's Wetland and Flood Hazard Area Regulations (Title 13, Subchapter E, Section 12240-12246 and Subchapter D, Section 12230-12236, Administrative Rules and Regulations, respectively).

The recently enacted Emergency Wetland Resources Act of 1986 also offers potential help to recovery efforts for this species. This Act authorizes the Fish and Wildlife Service and State/Territorial Wildlife Agencies to acquire wetlands for wildlife conservation. It may be possible to protect some wetlands via the Guam Land Conservation Act (PL-225, Sections 12600-12630, Government Code of Guam), which offers tax incentives for land owners to preserve certain lands. Opportunities to restore wetland habitats may arise under the provisions of the Food Security Act of 1985 (Farm Bill), although the U.S. Department of Agriculture (Farmers Home Administration) has no inventory lands currently identified on Guam or the CNMI.

The Guam DAWR and the CNMIDFW have collected incidental information on moorhens, but long-term life history studies have yet to be initiated.

II. RECOVERY

OBJECTIVES

Insufficient data are available at this time for development of a biologically sound Recovery Objective. Based on current theory regarding the management of viable populations, data on various demographic parameters of the Mariana common moorhen are needed before a biologically defensible recovery objective can be determined. Determining these demographic parameters, therefore, has become part of the recovery tasks outlined in this plan.

Interim recovery objectives (i.e., objectives for downlisting to threatened status) will be used while delisting objectives are determined. Downlisting objectives are to protect and manage wetlands and to maximize productivity and survival of the Mariana common moorhen throughout its range. Efforts will be oriented at protecting and managing a total of 240 ha (600 acres) of suitable wetland habitat on Guam, 120 ha (300 acres) on Saipan, and 30 ha (75 acres) on Tinian. Interim population targets will involve densities equal to or greater than 2.5 birds/ha (1 bird/acre) (600 adult birds for Guam, 300 birds for Saipan, and 75 birds for Tinian), and these population numbers and densities must be maintained for 5 consecutive years.

To achieve these interim goals, the primary tasks focus on providing stable, productive habitat for the Mariana common moorhen distributed throughout as much of the historic range as possible. Virtually all wetlands will require some level of management and long-term security to achieve downlisting recovery objectives. This will require: 1) securing and managing all primary habitats to maximize the habitat conditions for the moorhen; 2) maintaining the secondary habitats as wetlands; and 3) developing additional habitats to provide more wetlands as needed, and/or compensating for the unavoidable loss of existing

wetlands. An additional requirement to meet recovery goals will be minimizing mortality resulting from predation, poaching, and other factors. Habitat management is scheduled to start in 1992, and at an assumed population growth rate of 30 percent per year, starting in 1995, the downlisting population goals for Guam and Saipan should be reached by 2000. Population goals for Tinian have already been met. Once these goals are met and the population is maintained for 5 consecutive years, downlisting could by considered in 2005.

Delisting criteria for the Mariana common moorhen will be developed after completion of tasks 61 through 65 and the information gathered has been evaluated.

Narrative

1. Secure/manage existing Mariana common moorhen primary habitat to provide stable, productive conditions.

Primary habitat is the best current or potential moorhen habitat remaining and is considered essential to the recovery program. There are six primary wetlands identified: Agana Marsh, Fena Valley Reservoir, and Naval Station Marsh on Guam; Lake Hagoi on Tinian; and Lake Susupe and Puntan Muchot/Garapan on Saipan. This habitat needs to be secured and managed to provide optimum habitat conditions for the moorhen. Steps need to be taken to secure and improve the quality of these wetlands through management actions.

The first goal for each of these areas is to secure the habitat. Securing habitat refers to any number of means for assuring that management of the habitats in question will, as a primary concern, provide for the maintenance of habitat qualities needed for the moorhen. This does not necessarily preclude other uses of the area but it does require that manipulations of the habitat be compatible with its use by the Mariana common moorhen. Methods for securing habitat could range from a cooperative agreement to acquisition of land, in fee. For those areas controlled by the Navy, cooperative agreements that provide protection for the habitat should be drafted between Federal and local conservation agencies and the Navy. For wetlands fully or partially controlled by the local government, cooperative management agreements need to be developed between the appropriate conservation agencies and the local authorities with jurisdiction over the area. For wetland parcels that are privately owned, arrangements are needed to secure these areas.

Once primary habitat is secure, management plans need to be developed for each area. These management strategies need to address all habitat requirements of the moorhen, including nesting, feeding, and cover habitat. Finally, the management plans need to be implemented for each wetland. All management actions should be evaluated once they are implemented.

Proper habitat conditions need to be provided by managing wetland vegetation, by managing water levels, and by controlling predators. Proper habitat conditions require a mix of emergent vegetation to provide cover, nesting habitat, and invertebrate substrate, with open water for additional invertebrate growth and area for territorial displays. Maintaining this interspersion of emergent vegetation and open water requires management to control aggressive, non-desirable plants and to encourage desirable plant species.

Water levels are critical because they influence nesting activity, vegetation and invertebrate growth, and access by predators. Water levels need to be managed to allow for, or at least simulate, the natural water regime. Manipulating water levels should assist in the effective management of vegetation, if needed.

Finally, management actions are needed to prevent access by predators into moorhen habitat. Active on-site control may be needed, and, even then, some loss of moorhens to predators is expected.

11. Secure/manage moorhen primary wetland habitat on Guam.

Primary wetland habitats on Guam, as identified in Table 1, need to be secured and managed.

111. Secure/manage moorhen primary habitat at Agana Marsh.

Agana Marsh is a 70 ha, natural freshwater marsh. Ownership of this site is mixed; the majority is in private hands. About 16 ha is owned by the Government of Guam. Taro is currently being cultivated on 1 ha of the marsh, and this area is used by moorhens.

This marsh was probably excellent habitat in the past, but it has been changed significantly by human activities and by the increase of dense stands of vegetation, such as Phragmites karka. Little open water remains. Steps must be taken to secure and manage the marsh for the survival of the moorhen.

1111. Develop cooperative management agreements/secure habitat.

A cooperative management agreement needs to be developed between Guam Division of Aquatic and Wildlife Resources (GDAWR), the appropriate private parties, and the U.S. Fish and Wildlife Service (USFWS) to secure the habitat. Eventually, USFWS may wish to establish a refuge at this site.

1112. Develop management plan.

A management plan that controls the spread of undesirable vegetation and protects and expands desirable habitat, such as the taro cultivation area, needs to be developed. The amount of open water with adequate border vegetation needs to be increased.

1113. Implement management plan to maintain/restore moorhen habitat.

The marsh needs to be managed to provide more open water, with a sufficient mix of emergent vegetation, nesting habitat, and invertebrate substrate. The spread of undesirable vegetation, such as Phragmites karka, needs to be controlled and the spread of desirable vegetation encouraged.

11131. Manage wetland vegetation.

The spread of undesirable vegetation, such as Phragmites karka, needs to be controlled and desirable vegetation for protective cover and nesting encouraged, to maintain sufficient interspersion of emergent vegetation and open water. In areas where emergent vegetation or other nesting materials are in short supply, artificial structures, such as floating platforms, should be constructed.

11132. Manage water levels.

Water levels need to be managed to allow for, or at least simulate, the natural water regime. Manipulating water levels should assist in the effective management of vegetation, as well.

112. Develop cooperative agreement for Navy managed lands used as primary habitat by moorhens on Guam.

Fena Valley Reservoir and Naval Station Marsh are owned by the U.S. Navy. A cooperative agreement between GDAWR, the U.S. Navy, and the USFWS should be prepared to secure the habitat.

113. Manage moorhen primary habitat at Fena Valley Reservoir.

Fena Valley Reservoir is a large man-made lake. Although the steep banks and deep water over most of this reservoir limit the habitat potential for the moorhen, the fringes of portions of this reservoir have gentle slopes and support stands of emergent vegetation, thus providing good habitat for the moorhen. These areas should be secured and managed as moorhen habitat.

1131. Develop management plan.

See narrative for Task #1112.

1132. Implement management actions to maintain/restore suitable habitat.

See narrative for Task #1113.

11321. Manage wetland vegetation.

See narrative for Task #11131.

11322. Manage water levels.

See narrative for Task #11132.

114. Manage moorhen primary habitat at Naval Station Marsh.

Naval Station Marsh is a complex of marsh and ponds near the entrance to Apra Harbor on a Naval Reservation in west-central Guam. These wetlands total over 40 ha. While some portions are seriously degraded, others provide good habitat and still support moorhen. If managed properly this wetland could support a significant population of moorhen.

1141. Develop management plan.

See narrative for Task #1112.

1142. Implement management actions to maintain/restore suitable habitat.

See narrative for Task #1113.

11421. Manage wetland vegetation.

See narrative for Task #11131.

11422. Manage water levels.

See narrative for Task #11132.

12. Secure/manage moorhen primary wetland habitats on Tinian.

Primary wetland habitat on Tinian, as identified in Table 1, needs to be secured and managed.

121. Lake Hagoi.

Lake Hagoi is the most important wetland on Tinian. The total population of moorhens at this wetland is estimated to range from 20-125 birds. It is an 18-ha marsh with only a small portion, usually less than 1-ha, as open water. It is excellent habitat for the moorhen.

1211. Develop cooperative management agreement.

Lake Hagoi is leased by the U.S. Navy from the Commonwealth of Northern Mariana Islands Fish and Wildlife Division (CNMI). These two entities and the USFWS should enter into a cooperative agreement to secure this wetland.

1212. Develop management plan.

See narrative for Task #1112.

1213. Implement management actions to maintain/restore suitable habitat.

See narrative for Task #1113.

12131. Manage wetland vegetation.

See narrative for Task #11131.

12132. Manage water levels.

See narrative for Task #11132.

13. Secure/manage moorhen primary wetland habitats on Saipan.

Primary wetland habitat on Saipan, as identified in Table 1, needs to be secured and managed.

131. Lake Susupe.

Lake Susupe is one of the most important wetlands in the Mariana Islands. It is made up of about 160 ha of dense Phragmites stands, freshwater marsh and open water. It is primarily a natural wetland with a rich variety of emergent and floating vegetation, algae, mollusks, and aquatic insects. Lake Susupe is important to the moorhen, as well as other waterfowl.

1311. Develop cooperative management agreement to secure habitat.

Ownership is divided between local government and private interests. A cooperative management agreement should be developed between CNMI, the appropriate private parties, and the USFWS to secure this important habitat.

1312. Develop management plan.

See narrative for Task #1112.

1313. Implement management actions to maintain/restore suitable habitat.

See narrative for Task #1113.

13131. Manage wetland vegetation.

See narrative for Task #11131.

13132. Manage water levels.

See narrative for Task #11132.

132. Puntan Muchot/Garapan.

These two small areas, totaling about 4.5 ha, have been affected by intensive human activity, but still have good wetland habitat with potential for significant improvement. Moorhen consistently have been seen in this area, but the population size in not known.

1321. Develop cooperative management agreement, secure habitat.

Ownership of the smaller Garapan site is private while the adjacent Puntan Muchot is divided between private and public ownership. CNMI should enter into cooperative agreements with the appropriate entities including the USFWS to secure both of these sites.

1322. Develop management plan.

See narrative for Task #1112.

1323. Implement management actions to maintain/restore suitable habitat.

See narrative for Task #1113.

13231. Manage wetland vegetation.

See narrative for Task #11131.

13232. Manage water levels.

See narrative for Task #11132.

2. Maintain secondary moorhen habitat on Guam, Tinian, and Saipan.

Secondary wetlands provide important habitat for the moorhen, but many are small, overgrown with vegetation, and are only flooded seasonally. These areas are thus not considered core habitat areas for the moorhen. None are considered expendable, however, and some form of management is needed. These areas will continue to supplement the primary habitat areas if maintained as wetlands. The goal for these secondary habitats is to maintain them as wetlands to provide habitat for the moorhen within the context of their other uses. Cooperative management agreements for sustaining and enhancing all secondary habitats are needed.

Secondary habitats are owned or controlled variously by the U.S. Navy, by the local government, by private interests, or by a combination of these groups (Table 1). For each site, cooperative management agreements need to be developed with local conservation agencies and the respective owner or controlling agency. These management agreements should focus on sustaining and enhancing secondary habitat for the moorhen.

21. Develop a cooperative management agreement for sustaining/enhancing secondary habitat owned by U.S. Navy on Guam.

Those secondary habitats owned by the U.S. Navy need to be secured via a cooperative management agreement between GDAWR, USFWS and the U.S. Navy and managed to sustain moorhen populations. The wetlands that should be included in this agreement are:

Naval Magazine Marshes
Naval Magazine Pond
Piti Wetlands
San Louis Point Pond
Sumay Pond.

22. Develop a cooperative management agreement for sustaining/enhancing secondary habitat owned by Government of Guam.

Those secondary habitats owned by the Government of Guam need to be secured via a cooperative management agreement between the USFWS and the GDAWR and managed to sustain moorhen populations. The wetlands that should be included in this agreement are:

Barrigada Ponding Basin
DOA Wetland
Mangilao Prison Pond
Mariana Terrace Ponding Basin
Masso Reservoir
Toguan Bay Sewage Treatment Pond.

23. Develop a cooperative management agreement for sustaining/enhancing secondary habitat owned by CNMI on Tinian and Saipan.

Secondary habitat on Tinian and Saipan need to be secured and managed to support viable moorhen populations. Magpo wetland, on Tinian and Sadog Tase wetlands, on Saipan are owned by the local government (CNMI). The USFWS should insure that the habitat is managed to support moorhen populations through a cooperative management agreement with CNMI.

24. Develop cooperative management agreements for sustaining/enhancing secondary habitat that is partially or entirely owned by private interests on Guam and Saipan.

Arrangements are needed to secure secondary habitat that is privately owned or jointly owned by private interests and the Navy or CNMI, through means such as cooperative management agreements or acquisition of the lands, in fee.

241. Agfayan River, Guam.

Steps should be taken by GDAWR to secure this site either via cooperative agreement with the private landowner(s) or via acquisition of the land, in fee.

242. Ajayan River Floodplain, Guam.

See narrative for Task #241.

243. Guam Shell Inc., Guam

See narrative for Task #241.

244. Inarajan River Floodplain, Guam.

See narrative for Task #241.

245. Pulantat Marsh, Guam.

See narrative for Task #241.

246. Assupian, Guam.

See narrative for Task #241.

247. Yabai, Guam.

See narrative for Task #241.

248. Atantano Wetlands, Guam.

These wetlands are jointly owned by the U.S. Navy and private interests. A cooperative agreement between GDAWR, USFWS, the U.S. Navy and all appropriate private parties needs to be developed to secure these lands.

249. Namo River Marsh, Guam.

See narrative for Task #248.

250. Talofofo Floodplain, Guam.

This floodplain is jointly owned by the Government of Guam and private interests. GDAWR should enter into a cooperative management agreement with all appropriate private parties, or acquire the land in fee, to secure this floodplain.

251. Chalan Laulau Wetlands, Saipan.

These wetlands are privately owned. Steps should be taken by CNMI to secure this site either via cooperative agreement with the private landowner(s) or via acquisition of the land, in fee.

252. Tanapag Wetlands, Saipan.

These wetlands are jointly owned by CNMI and private interests. CNMI should enter into a cooperative management agreement with all appropriate private parties or acquire the land, via fee, to secure this habitat.

253. Kagman Wetlands, Saipan.

These wetlands are jointly owned by CNMI and private interests. See narrative for Task #252.

254. San Roque, Saipan.

This site is privately owned. See narrative for Task #251.

255. Flores Pond, Saipan.

This site is privately owned. See narrative for Task #254.

3. Develop wetlands other than the primary and secondary wetlands identified in this recovery plan.

Wetlands in the Marianas are limited and, for most, the quality of the habitat for moorhens is poor. If all primary and secondary habitats are maintained and provide habitat to their optimum capability, recovery goals in terms of habitat needs would be accomplished. If there are shortfalls of any kind, additional habitat will be needed.

31. Inventory other available wetland habitat in the Mariana Islands.

Increases in the availability of suitable habitat should be sought to supplement existing wetland habitat, as needed. One of the first steps in accomplishing this goal is to inventory available wetlands. Although most wetland sites of significance are addressed under Tasks 1 and 2, other wetlands with potential moorhen habitat undoubtedly exist and they should be identified and incorporated into the recovery plan.

32. Identify sites for potential restoration or creation of moorhen habitat.

Once surveys have been conducted for available wetlands, those that are potentially suitable as moorhen habitat should be identified. Additionally, non-wetland sites may be identified that could possibly be developed into good moorhen habitat. These opportunities should be studied and pursued, if feasible, to supplement existing habitat.

33. Implement actions to restore/create suitable habitat at selected locations.

Areas that have been identified as having potential should be restored or developed. These sites should be managed to create

the habitat conditions necessary to support productive moorhen populations. Potential management actions may include creating more open water and a mosaic of open water and edge vegetation.

4. **Maximize productivity and survival of adults and young.**

Moorhen and their habitats are subject to a variety of inimical factors that reduce production and survival beyond normal levels. To sustain healthy populations, these factors need to be controlled.

41. Minimize predation.

Although there is no evidence to suggest that introduced predators are a serious problem, feral cats, feral dogs, and the brown tree snake could be depressing moorhen populations in certain areas.

411. Develop means to control feral cats and dogs, as needed.

The impact of feral cats and dogs on the moorhen population needs to be understood and controlled.

4111. Determine the role of feral cats and dogs as a limiting factor.

Studies should be initiated to determine the role of these predators.

4112. Develop plan to control feral cats and dogs, as needed.

Develop a plan to control feral cats and dogs in moorhen habitat, as needed.

41121. Develop plan to control feral cats and dogs on Guam.

Develop a plan to control feral cats and dogs on Guam, as needed.

41122. Develop plan to control feral cats and dogs on CNMI.

Develop a plan to control feral cats and dogs on CNMI, as needed.

4113. Implement plan to control feral cats and dogs, as needed.

If predators prove to have a serious effect on the moorhen population, techniques should be implemented to minimize predation. Measures such as fencing, habitat manipulation, and trapping could be used for feral cats and dogs.

41131. Implement plan to control feral cats and dogs on Guam.

Implement plan to control feral cats and dogs on Guam, as needed.

41132. Implement plan to control feral cats and dogs on CNMI.

Implement plan to control feral cats and dogs on CNMI, as needed.

412. Control brown tree snakes, as needed.

The brown tree snake has been implicated as the major cause of the decline of most of Guam's bird species. Its effect on the moorhen population needs to be understood and controlled.

4121. Determine the role of brown tree snakes as a limiting factor.

Studies should be initiated to determine the role of brown tree snakes in the decline of moorhen populations.

4122. Develop techniques to minimize predation by brown tree snakes, as needed.

Control methods for the brown tree snake need to be developed.

4123. Develop plan to control brown tree snakes, if necessary.

Develop a plan to implement the techniques developed for controlling the brown tree snake. This plan will probably be a part of the plan being developed for Guam forest birds and bats to control the brown tree snake.

4124. Implement techniques to minimize predation by brown tree snakes, as needed.

Implement the plan developed for controlling the brown tree snake. Because the snake has had a serious effect on the native forest birds of Guam, and because it may spread to neighboring islands in the Marianas, recovery efforts for the moorhen could complement recovery programs for Guam forest birds and fruit bats regarding this pest species.

42. Minimize human disturbance.

Besides predation, human disturbance may be a problem for the moorhen, especially where cover is limited. Moorhen are secretive birds, and even though they can tolerate some disturbance, their use of an area depends on cover from real or perceived threats. Law enforcement is needed to prevent or at least minimize this problem.

421. Prevent poaching of moorhen.

Although the moorhen is fully protected by law, isolated incidents of shooting still occur. Efforts may be needed to prevent such poaching.

4211. Determine the role of poaching as a limiting factor.

Studies should be initiated to determine to what extent shooting impacts moorhen populations.

4212. Develop plan to control poaching, as needed.

Develop a plan with local law enforcement to reduce poaching, as needed.

42121. Develop plan to control poaching on Guam.

Develop plan to control poaching on Guam, as needed.

42122. Develop plan to control poaching on CNMI.

Develop plan to control poaching on CNMI, as needed.

4213. Implement plan to control poaching.

Implement the plan to control poaching.

42131. Implement plan to control poaching on Guam.

Implement plan to control poaching on Guam, as needed.

42132. Implement plan to control poaching on CNMI.

Implement plan to control poaching on CNMI, as needed.

422. Control access by people to sensitive habitats.

Access by people into certain sensitive habitats may need to be controlled.

4221. Determine to what extent human disturbance impacts moorhen populations.

Studies should be initiated to determine to what extent human disturbance impacts moorhen populations.

4222. Develop plan to control human disturbance, as needed.

Develop a plan with local law enforcement and local government to control human disturbance, as needed.

42221. Develop plan to control human disturbance on Guam.

Develop plan to control human disturbance on Guam, as needed.

42222. Develop plan to control human disturbance on CNMI.

Develop plan to control human disturbance on CNMI, as needed.

4223. Implement plan to control human disturbance, as needed.

Implement plan to control human disturbance.

42231. Implement plan to control human disturbance on Guam.

Implement plan to control human disturbance on Guam, as needed.

42232. Implement plan to control human disturbance on CNMI.

Implement plan to control human disturbance on CNMI, as needed.

43. Prevent contamination of wetland habitats with toxic substances.

Pollution is a problem that can seriously degrade habitat, and basic precautions should be taken to prevent it. Because moorhens may concentrate in a small wetland, contamination of water or food can affect a large number of individuals.

431. Monitor wetlands for toxic substances periodically as needed.

All wetlands should be monitored for toxic substances periodically or as needed.

432. Respond to contamination by contacting the environmental contaminant regional response team.

If any form of pollution is found, the environmental contaminant regional response team for Oceania should be notified. The lead agency for this Honolulu-based team is the U.S. Coast Guard. Several other branches of the military, along with the U.S. Fish and Wildlife Service, have specialists on the team. This team has the responsibility and capability to respond to oil spills and other sources of pollution.

5. **Monitor populations**.

All populations need to be monitored on a regular basis to determine the adequacy of recovery management strategies and to initiate changes in the management protocol as necessary.

51. Conduct periodic surveys in all habitats.

Population surveys are needed to assess the success of the recovery program. Surveys help to periodically judge the status of the population, evaluate the effectiveness of recovery efforts, identify problems, and determine when recovery goals are being met. Standardized techniques should be developed and used. Absolute counts will be difficult for

this retiring species. However, standardized survey techniques, yielding data comparable from year to year, will provide adequate indices.

52. Monitor and evaluate reproductive success.

In addition to surveying the population as a whole, surveys are needed to monitor the reproductive success of the moorhen in various wetlands. Methodology for monitoring productivity needs to be developed and recruitment surveys can then be established.

53. Determine seasonal movements.

To aid in the interpretation of survey results, seasonal movements of the birds should be studied. During the dry season, birds typically abandon certain wetlands that gradually dry up, but little is known about the direction or extent of movements. This important information may reveal significant limiting factors that affect the moorhen.

6. Determine biological parameters needed for development of delisting criteria.

In order to develop criteria for delisting, information is needed regarding certain biological parameters.

61. Verify demographic units.

Studies on the configuration of demographic units are needed. Presently, it is assumed that the moorhen population is divided into two demes, one on Guam and one on Tinian and Saipan. It would make a difference in the recovery goals if this assumed configuration was actually different.

62. Determine the number of individuals that prime habitat can support.

The carrying capacity for this subspecies in habitat throughout its range needs to be determined. This will provide population numbers to determine the risk of extinction at various population levels.

63. Determine the rate and variance of population growth.

Studies on survival and reproduction are necessary to determine the rate and variance of population growth. These data will be used to assist in assessing risks of extinction and development of recovery goals.

64. Determine the population size necessary to maintain genetic adaptability in this subspecies.

Survival over the long term depends on genetic adaptability in the population. Once the above data are available, they can be used to develop a best approximation of the minimum population size needed to maintain a genetically adaptable population.

65. Establish subpopulation (demographic) recovery level for each deme.

Once the minimum population size to maintain genetic adaptability has been determined, recovery targets can be set for each distinct deme.

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III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and estimated cost for the Mariana common moorhen recovery program. It is a guide for meeting the objectives of the Recovery Plan, as elaborated upon in Part II, Action Narrative Section. This schedule indicates task priority, task numbers, task descriptions, duration of tasks, the responsible agencies, and estimated costs. These actions, when accomplished, should bring about the recovery of the species and protect its habitat. Initiation of these actions is subject to the availability of funds.

Priorities in Column 1 of the following implementation schedule are assigned as follows:

Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.

Priority 3 - All other actions necessary to provide for full recovery of the species.

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
Need 1 (Secure/Manage Primary Habitat)											
Secure primary habitat on Guam:											
1	1111	Agana Marsh	1	GDAWR*	0	X					
				FWE	0	X					
1	112	USN Managed Lands	1	GDAWR*	0	X					
				FWE	0	X					
				USN	0	X					
Secure primary habitat on Tinian:											
1	1211	Lake Hagoi	1	CNMI*	0	X					
				USN	0	X					
				FWE	0	X					
Secure primary habitat on Saipan:											
1	1311	Lake Susupe	1	CNMI*	0	X					
				FWE	0	X					
1	1321	Puntan Muchot/ Garapan	1	CNMI*	0	X					
				FWE	0	X					
Develop management plans for primary habitats:											
1	1112	Agana Marsh	1	GDAWR*	2		2				
				FWE	1		1				
1	1131	Fena Valley Reservoir	1	GDAWR*	2		2				
				USN	1		1				
				FWE	1		1				
1	1141	Naval Station Marsh	1	GDAWR*	2		2				
				USN	1		1				
				FWE	1		1				

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
3	65	Establish subpopulation level for each deme.	1	FWE* GDAWR CNMI	5 1 1						
		Need 4 (Determine biol. parameters)			154	0	0	0	50	50	
		TOTAL COST			3536	21	118	292	287	287	

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
1	1212	Lake Hagoi	1	CNMI*	2		2				
				USN	1		1				
				FWE	1		1				
1	1312	Lake Susupe	1	CNMI*	2		2				
				FWE	1		1				
1	1322	Puntan Muchot/ Garapan	1	CNMI*	2		2				
				FWE	1		1				
				NPS	1		1				
Manage wetland vegetation:											
1	11131	Agana Marsh	C	GDAWR	264			22	22	22	
1	11321	Fena Valley Reservoir	C	GDAWR*	72			6	6	6	
				USN	24			2	2	2	
1	11421	Naval Station Marsh	C	GDAWR*	264			22	22	22	
				USN	24			2	2	2	
1	12131	Lake Hagoi	C	CNMI*	264			22	22	22	
				USN	24			2	2	2	
1	13131	Lake Susupe	C	CNMI	384			32	32	32	
1	13231	Puntan Muchot/ Garapan	C	CNMI*	132			11	11	11	
				NPS	24			2	2	2	
Manage water levels:											
1	11132	Agana Marsh	C	GDAWR	120			10	10	10	
1	11322	Fena Valley Reservoir	C	GDAWR*	60			5	5	5	
				USN	24			2	2	2	

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
1	11422	Naval Station Marsh	C	GDAWR* USN	120 24			10 2	10 2	10 2	
1	12132	Lake Hagoi	C	CNMI* USN	120 24			10 2	10 2	10 2	
1	13132	Lake Susupe	C	CNMI	120			10	10	10	
1	13232	Puntan Muchot/ Garapan	C	CNMI* NPS	120 24			10 2	10 2	10 2	
		Need 1 (Secure/Manage Primary Habitat)			2254	0	22	186	186	186	
		Need 2 (Supplement Primary Habitat)									
		Develop coop. mgmt. agreement for secondary habitat:									
2	21	Habitat Owned by USN on Guam	1	GDAWR* USN FWE	0 0 0			X X X			
2	22	Habitat Owned by the Gov. of Guam	1	GDAWR* FWE	0 0			X X			
2	23	Habitat Owned by CNMI	1	CNMI* FWE	0 0			X X			
2	241	Agfayan River Guam	1	GDAWR* FWE	0 0			X X			
2	242	Ajayan River Floodplain, Guam	1	GDAWR* FWE	0 0			X X			

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
2	243	Guam Shell Inc. Guam	1	GDAWR*	0			X			
				FWE	0			X			
2	244	Inarajan River Floodplain, Guam	1	GDAWR*	0			X			
				FWE	0			X			
2	245	Pulantat Marsh Guam	1	GDAWR*	0			X			
				FWE	0			X			
2	246	Assupian Guam	1	GDAWR*	0			X			
				FWE	0			X			
2	247	Yabai Guam	1	GDAWR*	0			X			
				FWE	0			X			
2	248	Atantano Wetlands Guam	1	GDAWR*	0			X			
				USN	0			X			
				FWE	0			X			
2	249	Namo River Marsh Guam	1	GDAWR*	0			X			
				USN	0			X			
				FWE	0			X			
2	250	Talofofo Flood-plain, Guam	1	GDAWR*	0			X			
				FWE	0			X			
2	251	Chalan Laulau Wetlands, Saipan	1	CNMI*	0			X			
				FWE	0			X			
2	252	Tanapag Wetlands Saipan	1	CNMI*	0			X			
				FWE	0			X			
2	253	Kagman Wetlands Saipan	1	CNMI*	0			X			
				FWE	0			X			

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
2	254	San Roque Saipan	1	CNMI* FWE	0 0			X X			
2	255	Flores Pond Saipan	1	CNMI* FWE	0 0			X X			
Develop other wetlands:											
2	31	Inventory other available wetland habitat in the Mariana Islands.	3	GDAWR* CNMI*	30 30			10 10	10 10	10 10	
2	32	Identify sites for habitat restoration or creation.	1	GDAWR* CNMI*	10 10						
2	33	Implement actions to restore/create habitat.	UNK	GDAWR* CNMI*	0 0						
		Need 2 (Supplement Primary Habitat)			80	0	0	20	20	20	
Need 3 (Maximize product. & survival)											
2	431	Monitor wetlands for toxic substances periodically.	0	GDAWR CNMI FWE* FWS-RES	28 28 70 28	2 2 5 2	2 2 5 2	2 2 5 2	2 2 5 2	2 2 5 2	
2	432	Respond to contaminants.	0	FWE* GDAWR CNMI	0 0 0	X X X	X X X	X X X	X X X	X X X	

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
2	51	Conduct periodic surveys.	0	GDAWR* CNMI	28 28	2 2	2 2	2 2	2 2	2 2	
2	52	Monitor and evaluate repro-ductive success.	0	GDAWR* CNMI	42 42	3 3	3 3	3 3	3 3	3 3	
2	53	Determine seasonal movements.	2	GDAWR* CNMI	25 25		15 15	10 10			
2	4111	Determine role of feral cats & dogs as limiting factors.	2	GDAWR* CNMI	10 10		5 5	5 5			
2	4121	Determine role of brown tree snake as limiting factor.	2	FWS-RES* GDAWR	40 30		20 15	20 15			
2	4211	Determine role of poaching as a limiting factor	2	FWS-RES* GDAWR CNMI	0 0 0		X X X	X X X			
2	4221	Determine impact human disturbance	2	FWS-RES* CNMI GDAWR	0 0 0		X X X	X X X			
2	41121	Develop plan to control cats and dogs on Guam	2	GDAWR*	10				5	5	
2	41122	Develop plan to control cats and dogs on CNMI	2	CNMI*	10				5	5	

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
2	42121	Develop plan to control poaching on Guam	2	FWS-RES* GDAWR	0 0				X X	X X	
2	42122	Develop plan to control poaching on CNMI	2	FWS-RES* CNMI	0 0				X	X	
2	42221	Develop plan to control human disturb. on Guam	2	FWS-RES* GDAWR	0 0				X X	X X	
2	42222	Develop plan to control human disturb. on CNMI	2	FWS-RES* CNMI	0 0				X X	X X	
2	4122	Develop techniques to minimize pred. by tree snakes	2	FWS-RES* GDAWR	0 0				X X	X X	
2	41131	Implement Plan to control cats and dogs on Guam	C	GDAWR* USN	189 18						
2	41132	Implement plan to control cats and dogs on CNMI	C	CNMI* USN NPS	189 9 9						
2	42131	Implement plan to control poaching on Guam	C	GDAWR*	45						
2	42132	Implement plan to control poaching on CNMI	C	CNMI*	45						

IMPLEMENTATION SCHEDULE FOR THE MARIANA COMMON MOORHEN RECOVERY PLAN

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURA-TION (YRS)	RESPONSIBLE PARTY	TOTAL COST	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	COMMENTS
2	42231	Implement plan to control human distrub. on Guam	C	GDAWR*	45						
2	42232	Implement plan to control human distrub. on CNMI	C	CNMI*	45						
2	4123	Develop plan to control brown tree snakes	1	FWS-RES* GDAWR	0 0						
2	4124	Implement techniq. to minimize pred. by tree snake	C	FWS-RES* GDAWR	0 0						
		Need 3 (Maximize product. & survival)			1048	21	96	86	31	31	
Need 4 (Determine biol. parameters)											
3	61	Verify demographic units.	3	GDAWR* CNMI*	30 30				10 10	10 10	
3	62	Determine carrying capacity.	2	GDAWR* CNMI*	10 10				5 5	5 5	
3	63	Determine rate & variance of population growth.	3	GDAWR* CNMI*	30 30				10 10	10 10	
3	64	Determine population size necessary to maintain genetic adaptability.	1	FWS-RES* GDAWR CNMI	5 1 1						

KEY FOR RESPONSIBLE AGENCIES IDENTIFIED IN IMPLEMENTATION SCHEDULE

GDAWR - Guam Division of Aquatic and Wildlife Resources

CNMI - Commonwealth of the Northern Mariana Islands Fish and Wildlife Division

FWE - U.S. Fish and Wildlife Service, Fish and Wildlife Enhancement, Endangered Species

FWS-RES - U.S. Fish and Wildlife Service, Research

USN - U.S. Navy

NPS - National Park Service

X _ Cost to be determined

* - Lead agency

Continuing- Continuing once initiated

Ongoing - Action now being implemented and continuing

TOTAL COST- Projected cost of task from start of task to completion or for ongoing / continuous tasks until 2005

APPENDIX

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